Modeling Strategy Maps and Balanced Scorecards using iStar

Constantinos Giannoulis, Jelena Zdravkovic

Department of Computer and Systems Sciences (DSV),
Stockholm University
Forum 100, SE-164 40 Kista, Sweden
constantinos,jelenaz@dsv.su.se
http://www.dsv.su.se

Abstract. Aligning business strategy to enterprise models requires explicit models from both areas, mapped to each other. Mapping existing business strategy definition approaches to requirement engineering practices improves strategy dissemination towards development. In this paper we present an illustration of such a mapping using the Strategy Maps and Balanced Scorecards as a business strategy approach and iStar (i*) as a requirements engineering practice exemplified using a case scenario.

Keywords: business strategy, strategy maps, balanced scorecards, iStar, requirements, SMBSC

1 Introduction

Organizations aim at enabling the communication of business strategy by linking decision makers to practitioners, to align people, products and services with long-term visions, and help in ensuring the strategy's successful implementation. Various alignment efforts have addressed the alignment between business strategy and requirements for system development in accordance to stakeholders needs and intentions [1–4]. However, there still exists an understanding gap between the business world and the IT world, which constitutes business strategy unknown, thus hindering business-IT alignment [3, 5, 6].

To address this gap, in a previous study [7], we have developed a meta-model of Strategy Maps & Balanced Scorecards [8] (named SMBSC onwards). Consequently, we aim to explore how can our meta-model influence the application of business-IT alignment methods, which requires defining mappings of our meta-model towards distinct requirement languages to complement alignment methods. Therefore, in this paper we extend our meta-model by providing mappings to i* [9], a goal modeling technique used in requirements engineering, and particularly to the unified meta-model proposed by Lucena et al [10]. In contrast to Babar et al [11], where mappings were provided based on the original form of SMBSC and constructs of i* [9], we have chosen sources with a formal basis.

Section 2 presents our proposed mappings, section 3 illustrates how the mappings have been used in a case scenario and section 4 provides our conclusions and sets the steps forward.

2 Mapping of SMBSC to i*

In this section we present how concepts of SMBSC can be mapped to i* in respect to their meta-models.

The *Strategy Map* class is used to capture the complete SMBSC including all causality relationships among all goals across an organization, therefore, using i* to capture the complete SMBSC requires both the *Strategic Dependency model (SD)* as well as the *Strategic Rationale Model (SR)* [1], which capture respectively, all the dependencies within the organizational context modeled as well as all the intentional elements.

The notion of grouping is present in both meta-models. In SMBSC there exists a *Group* class that captures all groupings of goals, where the highest level of grouping is among the four perspectives expressed through a specialization to a *Perspective* class. Other groupings within each perspective are captured by a recursive association, enhanced by constraints that make sure groups form a tree structure through nesting. In i* the notion of grouping is not present as such, however, the abstract notion of an actor is used to include the relevant intentional elements and there is a distinction between the dependencies among actors (SD) and the detailed rational of their dependencies (SR). Therefore, the notion of actor in i* can be related to the group of SMBSC and instead of constructing actor models, we are constructing group models. The i* actor can facilitate the Group class of SMBSC by extending its boundaries to facilitate organizational groupings, hence represent an organizational entity with defined dependencies. Therefore, for SMBSC, the SD is fixed with four abstract actors which refer to the organizational perspectives of SMBSC. The dependencies between those perspectives adhere to the i* meta model (the *DependencyRelationship* class); one is a dependee and the other is the depender. Similarly, dependencies may exist for any subgrouping (various *Group Types*), across the actors defined within actors that represent different perspectives.

In SMBSC the *Goal* class encompasses all goals defined across the four perspectives which are not necessarily measurable. Measurable goals extend the strategy map into balanced scorecards. A measurable goal, which is an objective in SMBSC, is also a goal in i*, whereas a non-measurable goal, which is not an objective in SMBSC, is a soft-goal in i*. The *Milestone* class, as well as the *Target* class, are intermediate states of an objective, usually related to some deadline or some value as mandated by the *Measure* class, used to demonstrate an objective's achievement. Both milestone and target, in conjunction to measure, are expressed as i* goals. The *Initiative* class in SMBSC can be either a *Task* or a *Plan* or a *Resource (consumed or produced)* in i*. In SMBSC,

[1] The instantiation of the *Dependency* class and the *InternalElement* class indicates the existence of the SD model the SR model respectively.

the associations linking goals (*influences*, *is influenced by*) adhere to the *InternalElementRelationship* of i* in a constraint manner. i* goals originating from SMBSC objectives are linked to i* goals originating from SMBSC milestones and targets through *MeansEnd*, i* goals originating from SMBSC objectives can be linked to i* soft-goals originating from SMBSC goals (non-measurable) through *MeansEnd*, and the opposite, i* tasks or plans (not resources) originating from SMBSC initiatives can be linked to i* goals originating from SMBSC milestones and targets, not objectives, through *MeansEnd*.

In SMBSC a theme captures a particular selection of goals across the four perspectives, with significant interest. This can be expressed in i* using the *IntentionalType* of the *Dependency* class (critical, open, committed). Therefore, all dependencies of type critical constitute a theme. Similarly to classes and associations, constraints defined for the SMBSC meta-model have also been considered when defining the mappings. Due to space limitations we present an example of two constraints for the goal class.

In SMBSC, every goal included in a theme is also included in the strategy map for which the theme is defined. In i*, a Theme consists of all the nodes whose DependencyRelationship is of critical DependencyStrength (SD models), which when expanded they include InternalElements, such as goals. Therefore, goals included in actors who are related with critical dependencies belong to a theme and also belong to the SR and SD model, ergo to the complete Strategy Map, as mapped earlier. In SMBSC, goal influences are restricted according to the perspective they belong to, therefore, financial goals can be influenced by customer goals and other financial goals while they can only influence other financial goals only. Therefore, financial goals can be dependers to customer goals and other financial goals while they can be dependees to other financial goals only. Customer goals can be influenced by internal goals and other customer goals while they can influence financial goals and other customer goals. Therefore, customer goals can be dependers to internal goals and other customer goals while they can be dependees to financial goals and other customer goals. Internal goals can be influenced by learning and growth goals and other internal goals while they can influence customer goals and other internal goals. Therefore, internal goals can be dependers to learning and growth goals and other internal goals while they can be dependees to customer goals and other internal goals. Learning and growth goals can be influenced only by other learning and growth goals while they can influence internal goals and other learning and growth goals. Therefore, learning and growth goals can be dependers to only other learning and growth goals while they can be dependees to internal goals and other learning and growth goals. In i* this is captured by the fixed dependencies among perspectives.

3 Example case: ABB's SMBSC in i*

To illustrate the applicability of our mappings, we use the case of ABB Industrie AG [12] modeled using the SMBSC meta-model [7] and due to space limitations we present the Potential perspective (Learning and Growth). The potential perspective includes two strategic goals. The goal, *our employees are competent and*

motivated, is measured by the *average number of jobs to which an employee can be assigned*, has milestones *5 for the end of 1st year* and *7 for the end of 2nd year* and targets at *9 for the end of 3rd year*. The goal, *we pursue a proactive human resource management*, is measured by the *average number of months needed until free resources are available to fulfill a new task*, has milestones *5 for the end of 1st year* and *3 for the end of 2nd year* and targets at *2 for the end of 3rd year*.

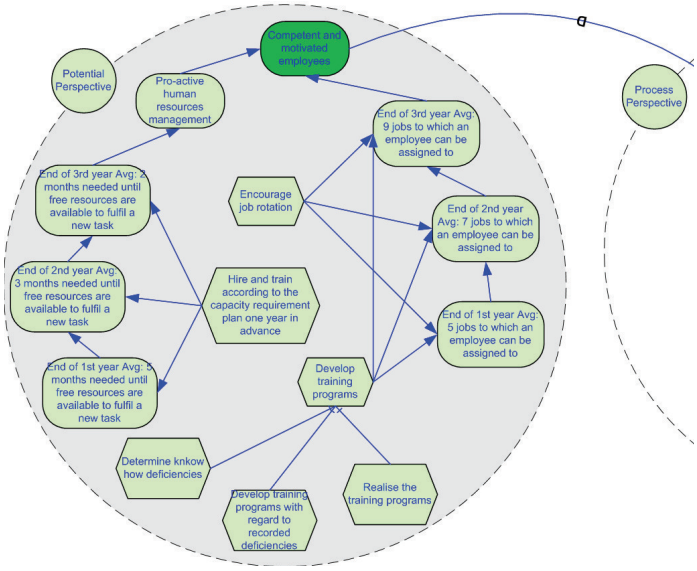

Fig. 1. Fig. 1. The SR model: The Potential perspective for the ABB case scenario.

Based on the aforementioned mappings, the SD model consists of the four perspectives of ABB Industrie which are presented as actors along with their fixed dependencies following the constraints exemplified.

For the SR model, the SD model is expanded to provide the *InternalElements* of each perspective. Milestones and targets of SMBSC are mapped to i* goals and are linked through mean-end links both between themselves as well as with i* goals originating from the SMBSC goals. For the potential perspective (figure 1) the goal *End of 1st year Avg: 5 jobs to which an employee can be assigned to* originates from the SMBSC milestone *End of 1st year: 5*, where the SMBSC measure is the *Average number of jobs to which an employee can be assigned.* Therefore, this goal is means to the end expressed by the goal *End of 2nd year Avg: 7 jobs to which an employee can be assigned to*, which originates from the SMBSC milestone *End of 2nd year: 7*, where the SMBSC measure is the *Average number of jobs to which an employee can be assigned.* Consequently, this goal is the means to the end expressed by the goal *End of 3rd year Avg: 9 jobs to which an employee can be assigned to*, which originates from the SMBSC target *End of 3rdd year: 9*, where the SMBSC measure is the *Average number of jobs to which an employee can be assigned.* Finally, this goal is one of two means to the end expressed by the goal *Competent and motivated employees*, which originates

from the SMBSC goal *Our employees are competent and motivated*, where the SMBSC measure is the *Average number of jobs to which an employee can be assigned*.

Initiatives (named *Strategic Programs* in [12]) are mapped to i* tasks and are linked through mean-end links only to i* goals originating from SMBSC milestones and targets. *Actions* in [12]) included in initiatives are mapped to i* tasks and are linked through decomposition to i* tasks originating from SMBSC initiatives. For example, in the potential perspective, the task *Develop training programs* originates from the SMBSC initiative *Development of training programs*. The task is the means to the ends expressed by the goals *End of 1st year Avg: 5 jobs to which an employee can be assigned to*, *End of 2nd year Avg: 7 jobs to which an employee can be assigned to* and *End of 3rd year Avg: 9 jobs to which an employee can be assigned to*. Additionally, the task *Develop training programs* is linked through decomposition to the tasks *Determine the know-how deficiencies*, *Develop training programs with regard to recorded deficiencies* and *Realize the training programs* which respectively originate from the SMBSC actions originating from the *Determination of know-how deficiencies*, *Development of training programs with regard to recorded deficiencies* and *Realization of the training programs*.

4 Conclusions and future work

In this paper, despite the different purpose and domains of use of SMBSC and i*, we have provided concept mappings between the two meta-models exemplified with an illustrative case scenario for which we have successfully modeled SMBSC using i* (figure 1).

Using i* to model SMBSC allows transition to requirements engineering supporting business-IT alignment methods. When i* is used during the early phase of requirements engineering, it can be enriched with stakeholders' intentional elements from SMBSC. The unified i* meta-model supports *OrDecomposition*, which can facilitate SMBSC with alternatives for initiatives. *Contribution* links provided by the unified i* meta-model (*enough, positive, notenough, negative*) could be used among goals and soft-goals in SMBSC allowing the identification of possible conflicts or synergies among the goals set, which is currently not present. By using the i* unified meta-model, our mappings are applicable to two variants of i*, resulting into greater applicability.

Additionally, the mappings have brought up some unaddressable issues, which could be used to extend the i* unified meta-model. (a)The class *Measure* in SMBSC has not been mapped directly to any notion or construct of the i* meta-model but it has been used implicitly when expressing i* goals originating from SMBSC milestones and targets. (b)The links between milestones, targets and objectives; in SMBSC there is a sequence expressed between these notions and i* does not support any kind of timeliness. The result is that each task is linked to every goal originating from SMBSC milestones and targets through means end links. The introduction of a *Precedence* link as a construct to address the issue of sequences and priorities has been proposed in [13], which would allow

timely appropriate links between tasks and goals originating from SMBSC milestones and targets. (c)According to the unified i* meta-model, means-end links are allowed between goal and goals in both variations of i* described, however, the i* guide [14] explicitly mentions that means-end links between goals is wrong, rather only tasks are linked through means-end to goals.

Finally, our future research steps include the evaluation of our mappings within a case where SMBSC will be the starting point but it will involve the early phase of requirements engineering, to illustrate the potential for traceability from strategy to concrete requirements.

References

1. Thevenet, L.H., Salinesi, C.: Aligning IS to organization's strategy: the INSTAL method. In: 19th International Conference on Advanced Information Systems Engineering (CaiSE'07), (2007)
2. Bleistein, S.J., Cox, K., Verner, J.: Validating strategic alignment of organizational IT requirements using goal modeling and problem diagrams. J. Systems and Software. 79, pp. 362–378 (2006)
3. Singh, S.N., Woo, C.:Investigating business-IT alignment through multi-disciplinary goal concepts: Requirements Engineering, 14, pp. 177–207 (2009)
4. van der Raadt, B., Gordijn, J., Yu, E.: Exploring web services ideas from a business value perspective. In: 13th IEEE International Conference on Requirements Engineering (RE05), pp. 53-62, IEEE CS (2005)
5. Chan, Y.E., Horner, R.B.: IT alignment: what have we learned? Journal of Information Technology, 22, 4, pp. 297 (2007)
6. Luftman, J.: Assessing business-IT alignment maturity: Communications of the Association for Information Systems, 4, (2000) article 14
7. Giannoulis, C., Petit, M., Zdravkovic, J.: Modeling Business Strategy: A Metamodel of Strategy Maps and Balance Scorecards. In: 5th IEEE International Conference on Research Challenges in Information Science (RCIS2011) (2011)
8. Kaplan R.S., Norton D.P.: Strategy Maps: Converting Intangible Assets into Tangible Outcomes. Harvard Business School Press, Boston (2004)
9. Yu, E. Modeling strategic relationships for process reengineering: PhD Thesis, Department of Computer Science, University of Toronto, (1995)
10. Lucena, M., Santos, E., Silva, C., Alencar, F., Silva, M.J., Castro, J.: Towards a unified metamodel for i*. In: 2nd International Conference on Research Challenges in Information Science (RCIS 2008), pp.237–246 (2008)
11. Babar, A., Zowghi, D., Chew, E.: Using Goals to Model Strategy Map for Business IT Alignment. In: 5th International Workshop on Business/IT Alignment and Interoperability (BUSITAL 2010), pp. 1630 (2010)
12. Ahn, H.: Applying the Balanced Scorecard Concept: An Experience Report. Long Range Planning, vol. 34, pp. 441-461 (2001)
13. Liaskos, S., Mylopoulos, J.: On Temporally Annotating Goal Models. In: Proceedings of the 4th International i* Workshop (iStar2010), CEUR vol 586, pp. 62-66 (2010)
14. i* wiki, *http://istar.rwth-aachen.de/tiki-index.php?page_ref_id=271* (last accessed on 05-06-2011)